

Claims

We claim:

1. A method comprising:

bonding an optical semiconductor element to a lead frame, the optical semiconductor element having a radiation-sensitive portion;

applying a transparent adhesive element to at least the radiation-sensitive portion;

and

applying an aperture member to the transparent adhesive element.

2. A method comprising:

bonding an optical semiconductor element to a lead frame, the optical semiconductor element having a radiation-sensitive portion;

applying a transparent adhesive element to at least the radiation-sensitive portion;

selecting an aperture member; and

applying the aperture member to the transparent adhesive element.

3. A method as claimed in claim 2, wherein the aperture member is selected for a least one physical characteristic.

4. A method as claimed in claim 2, wherein the aperture member is selected and applied to the transparent adhesive element by a programmable pick-and-place semiconductor assembly machine.

5. A method as claimed in claim 2, wherein the optical semiconductor element is bonded to the lead frame with a bonding agent selected from the group consisting of a silver-filled epoxy, a polyimide epoxy, a thermally conductive epoxy, a thermally nonconductive epoxy, an electrically nonconductive epoxy, an adhesive tape, and a metal alloy.
6. A method as claimed in claim 2 wherein the transparent adhesive element is selected from the group consisting of silicon, polyimide epoxy, and adhesive tape.
7. A method as claimed in claim 2, comprising the additional step of bonding at least a first connecting electrical conductor between at least a first circuit contact on the optical semiconductor element and at least a first lead on the lead frame.
8. A method as claimed in claim 7, wherein the first connecting electrical conductor comprises a wire fabricated from a metal selected from the group consisting of gold, aluminum, and copper.
9. A method as claimed in claim 2, comprising the additional step of encapsulating the optical semiconductor element, the transparent adhesive element, and the aperture member with an encapsulating agent.
10. A method as claimed in claim 9, wherein the encapsulating agent is an epoxy molding compound.
11. A method comprising:

bonding an optical semiconductor element to a printed circuit board, the optical semiconductor element having a radiation-sensitive portion;

applying a transparent adhesive element to at least the radiation-sensitive portion;

selecting an aperture member; and

applying the aperture member to the transparent adhesive element.

12. A method as claimed in claim 11, wherein the aperture member is selected for a least one physical characteristic.

13. A method as claimed in claim 11, wherein the aperture member is selected and applied to the transparent adhesive element by a programmable pick-and-place semiconductor assembly machine.

14. A method as claimed in claim 11, wherein the optical semiconductor element is bonded to the printed circuit board with a bonding agent selected from the group consisting of a silver-filled epoxy, a polyimide epoxy, a thermally-conductive epoxy, a thermally nonconductive epoxy, an electrically nonconductive epoxy, an adhesive tape, and a metal alloy.

15. A method as claimed in claim 11, wherein the transparent adhesive element is selected from the group consisting of silicon, polyimide epoxy, and adhesive tape.

16. A method as claimed in claim 11, comprising the additional step of bonding at least a first connecting electrical conductor between at least a first circuit contact on the optical semiconductor element and at least a first printed circuit board contact on the printed circuit board.

17. A method as claimed in claim 16, wherein the first connecting electrical conductor comprises a wire fabricated from a metal selected from the group consisting of gold, aluminum, and copper.

18. A method as claimed in claim 11, comprising the additional step of encapsulating the optical semiconductor element, the transparent adhesive element, and the aperture

member with an encapsulating agent.

19. A method as claimed in claim 18, wherein the encapsulating agent is an epoxy molding compound.

20. A method comprising:

bonding an optical semiconductor element to a substrate, the optical semiconductor element having a radiation-sensitive portion;

applying a transparent adhesive element to at least the radiation-sensitive portion;

selecting an aperture member; and

applying the aperture member to the transparent adhesive element.

21. A method as claimed in claim 20, wherein the aperture member is selected for a least one physical characteristic.

22. A method as claimed in claim 20, wherein the aperture member is selected and applied to the transparent adhesive element by a programmable pick-and-place semiconductor assembly machine.

23. A method as claimed in claim 20, wherein the substrate comprises a material selected from the group consisting of rubber, ceramic, and bismallimide triazene.

24. A method as claimed in claim 20, wherein the substrate provides a least a first substrate electrical conductor.

25. A method as claimed in claim 20, wherein the optical semiconductor element is bonded to the substrate with a bonding agent selected from the group consisting of a

silver-filled epoxy, a polyimide epoxy, a thermally-conductive epoxy, a thermally nonconductive epoxy, an electrically nonconductive epoxy, an adhesive tape, and a metal alloy.

26. A method as claimed in claim 20, wherein the transparent adhesive element is selected from the group consisting of silicon, polyimide epoxy, and adhesive tape.

27. A method as claimed in claim 24, comprising the additional step of bonding at least a first connecting electrical conductor between at least a first circuit contact on the optical semiconductor element and at least the first substrate electrical conductor.

28. A method as claimed in claim 27, wherein the first connecting electrical conductor comprises a wire fabricated from a metal selected from the group consisting of gold, aluminum, and copper.

29. A method as claimed in claim 20, comprising the additional step of encapsulating the optical semiconductor element, the transparent adhesive element, and the aperture member with an encapsulating agent.

30. A method as claimed in claim 29, wherein the encapsulating agent is an epoxy molding compound.

31. A method as claimed in claim 24, comprising the additional step of attaching at least a first solder ball to at least the first substrate electrical conductor.